DOCUMENT RESUME

ED 356 515 CS 508 168

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TITLE Remembrance of Coverage Past: Agenda-Setting Effects of Television News Coverage and the Effects Decay Curve.
PUB DATE Aug 92
NOTE 41p.; Paper presented at the Annual Meeting of the Association for Education in Journalism and Mass Communication (75th, Montreal, Quebec, Canada, August 5-8, 1992).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Agenda Setting; *Mass Media Effects; Media Research; Memory; *Models; *News Media; Political Issues; Public Opinion; Research Methodology
IDENTIFIERS *Issue Salience; *Media Coverage; Research Suggestions; Television News

ABSTRACT

To derive a model for testing, research questions were formulated which asked how long news coverage viewed in the past continues to influence the perceived salience of issues and the rate at which the influence drops off. To do this, some common factors that have been shown to affect public perceptions of issue salience, such as the prominence of the media coverage, the obtrusiveness of the issue being covered, and the amount of past coverage of the issue were addressed in the research. Three issues (inflation, Iran, and the Soviet Union) were investigated over an 1826-day period, using the daily prominence of television coverage obtained from television news archives and daily salience of the issues interpolated from monthly achieved poll data. The size of the relationship between accumulated coverage and issue salience was found to decrease with the amount of coverage of an issue prior to the beginning of the study period. A new unobtrusive issue (Iran) was found to have the strongest agenda-setting effects and more rapidly declining coverage effects than other issues. The model must be further tested in other types of agenda-setting studies, including individual-level analyses. Additional replications with other issues are necessary to further confirm the impact of issue age and obtrusiveness. These should include media other than television, to insure that media-specific effects are not confused with coverage effects. (One table of data and five figures are included; an appendix of poll dates and types, and 42 references are attached.) (RS)

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REMEMBRANCE OF COVERAGE PAST: AGENDA-SETTING EFFECTS OF TELEVISION NEWS COVERAGE AND THE EFFECTS DECAY CURVE

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Presented to the Association for Education in Journalism and Mass Communication Communication Theory and Methodology Division, Montreal, Canada, August 1992.

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ABSTRACT

REMEMBRANCE OF COVERAGE PAST: AGENDA-SETTING EFFECTS OF TELEVISION NEWS COVERAGE AND THE EFFECTS DECAY CURVE

Some fundamental concepts in agenda setting are related to a simple cognitive memory decay process. Accounting for issue obtrusiveness and amounts of prior coverage, predictions for the size of the relationship between declining accumulated television coverage and issue salience are derived. Levels of declining accumulated coverage are estimated by applying an exponential decay function to the prominence of daily television coverage. This function presumably models simple forgetting of coverage which occurs within individual audience members. Three issues (inflation, Iran, and the Soviet Union) were investigated over an 1826 day period, using the daily prominence of television coverage obtained from television news archives and daily salience of the issues interpolated from monthly archived poll data. The size of the relationship between accumulated coverage and issue salience was found to decrease with the amount of coverage of an issue prior to the beginning of the study period. A new unobtrusive issue (Iran) was found to have the strongest agenda-setting effects and more rapidly declining coverage effects than other issues.

Since McCombs and Shaw (1972) published their study documenting the agenda-setting effects of the news media, scholars have worked to describe the agenda-setting process as it operates over time. Two common questions have been: (1) what is the optimal time lag between the appearance of news reports on an issue (or audience exposure to the reports) and subsequent shifts in the public's perceptions of the importance of the issue (e.g. Brosius & Kepplinger, 1990; Behr & Iyengar, 1985; Eaton, 1989; Eyal, Winter, and DeGeorge, 1981; Salwen, 1988; Stone and McCombs, 1981; Watt & van den Berg, 1981; Winter, 1981); and (2) what are the cumulative effects of media over time (e.g. Salwen, 1988; Stone & McCombs, 1981; Watt & van den Berg, 1981)?

In the present research we have redefined the questions somewhat, to ask how long news coverage viewed in the past continues to influence the perceived salience of issues, and to determine the best description of the rate at which the influence drops off. To do this, we address some common factors that have been shown in the past to affect public perceptions of issue salience, such as the prominence of the media coverage, the obtrusiveness of the issue being covered, and the amount of past coverage of the issue. These influences are related to a classical memory decay process which is presumed to occur in individual audience members. A model that is consistent with the process, when aggregated across the entire audience, is derived for testing.

Optimum Effect Span for Coverage

The optimum effect span has sometimes been conceptualized as the time gap that produces the greatest association between the amount or prominence of media coverage at a particular date and the public salience of an issue at a later date, measured by time-lagged

correlations (Brosius & Kepplinger, 1990; Eyal, Winter, and DeGeorge, 1981; Zucker, 1978). The problem in describing media effects in terms of simple time lags is that it implies a fairly strange pattern of influence. A lag of one month means that only last month's coverage will influence today's issue salience, and that all subsequent coverage, including current coverage, will have no effect on salience. Likewise, all coverage prior to the lag interval will have no influence. There is no good theoretical reason to expect this kind of media influence.

An alternative conceptualization involves aggregating past coverage along with current coverage in a "time window". All the past coverage accumulated within this time window is used to predict the current issue salience. The coverage effect question is then changed slightly toward looking for the optimal length (or duration) of the accumulation time window or span. In other words, how long do people continue to be affected by past stories in the media? But this too is an artificial view of media influence, as it implies that all coverage of equal prominence within the time window has an impact, while all coverage outside the window has no influence. A time window of 30 days implies that coverage from 29 days ago has equal influence with today's coverage, while that from 31 days ago has no influence at all.

As Eaton (1989) pointed out, the time windows for different issues have had quite a wide range. Weeks (e.g. Brosius and Kepplinger, 1990), fortnights (Eaton, 1989), months (e.g. Demers, Craff, Choi, and Pessin, 1989; Zucker, 1978), two-month periods (Behr & Iyengar, 1985), and years (Funkhouser, 1973a, 1973b) have all been used as time units. Past studies have chosen time windows rather arbitrarily, and they have been limited by the time periods implicit in media coverage indices like the Reader's Guide or New York Times Index, and by the frequency of public opinion polls.

The few studies that have tested for the optimal accumulated coverage span find results varying from two weeks to six months. Eaton (1989) looked at 11 issues, and found optimal

spans ranging from two weeks to 12 weeks. Behr & Iyengar (1985) found the largest effects for coverage accumulated over two months (energy) and four months (inflation) prior to polling. A Canadian study (Winter, Eyal, & Rogers, 1982) found that one month was the optimum accumulated time span for inflation, five to six months for unemployment, and two to six months for national unity. Two single issue studies also found a range of a few weeks was best -- four to eight weeks for civil rights news (Winter & Eyal, 1981), and eight to ten weeks for environmental news (Salwen, 1988). The optimal accumulation time period was longer (two to six months) in a study of Time and Newsweek coverage (Stone and McCombs, 1981).

Individual-Level Processes in Time Lags and Windows

If we conceptualize the invidividual-level implications of time lags and windows, more problems are apparant. Time lags imply two types of invidividual-level process. The first is a poorly specified "delay" process in which exposure must be integrated with other cognitive or social interaction elements before it produces an effect. The presumption is that this integration requires some time, so the effect of coverage is delayed. Second, the accumulated effect of coverage at the individual level must involve some accumulated memory of prior coverage. When coverage at several time lags is used to predict current issue salience, the memory process is implicitly being modeled, as the information (or the processed residuals of the information, such as salience weights and opinion strength) from several past time points must be held in memory in order to produce an effect on the current salience level.

Time windows more explicitly address the situation of memory. Effects from media coverage over a number of days are aggregated. Presumably, this coverage persists in an individual's memory from the point of exposure to the point of measurement of issue salience. But the memory process is the rather strange step-function mentioned above: no

memory before the beginning of the time window, followed by perfect memory for the entire duration of the time window.

Issue Obtrusiveness

For some time, scholars have noted that one reason why agenda-setting effects seem to vary by issue is that the effect may depend on the issue's obtrusiveness. The argument is that the less direct experience people have with a given issue (that is, the less obtrusive the issue), the more they will rely on the news media for information, interpretation, and agenda salience (Zucker, 1978). When people have direct experience with issues, as they do for the pocket-book issues of inflation and unemployment, those issues are already salient regardless of the amount of media coverage. Note that Zucker's hypothesis can be subsumed under the media dependency hypothesis of Ball-Rockeach and DeFleur (1976), which predicts that media effects will be greater when people do not have personal sources of information and when issue conflict is high, indicating a need-to-know.

The obtrusiveness hypothesis has been tested in a variety of studies, some measuring both obtrusive and unobtrusive issues, and others considering only one type or the other. The studies are fairly consistent in finding that the coverage of unobtrusive issues has an agenda-setting effect (Atwater, Salwen, and Anderson, 1985; Demers, Craff, Choi, & Pessin, 1989; Eyal, 1979; Iyengar, Peters, and Kinder, 1982; Winter, 1981; Weaver, et al., 1981; Zucker, 1978). However, the agenda- setting effect for unobtrusive issues seems to be limited by the cognitive process of selective attention to personally relevant information. For example, Wanta, Williams, & Hu (1991) found that there must be some degree of U.S.involvement for international news to show agenda-setting effects with American audiences.

On the other hand, the results of studies of agenda-setting for obtrusive issues are mixed. An experiment by Iyengar, Peters and Kinder (1982) showed no agenda-setting

effects for the obtrusive issue of inflation. Zucker's table (1978, p. 235) indicates that two out of three of his obtrusive issues did indeed show agenda- setting effects (cost of living and employment, while crime did not). Other studies have found agenda-setting for obtrusive issues (Behr & Iyengar, 1985; Demers, Craff, Choi, & Pessin, 1989, p. 804, Table 2; Iyengar & Kinder, 1987, p. 31; MacKuen, 1981; Sohn, 1984), while comparative studies (Palmgreen and Clarke, 1977; Winter, 1981) found weaker agenda-setting effects for obtrusive issues, as compared to unobtrusive issues. In Eaton's (1989) study of 11 issues over time, some issues traditionally defined as obtrusive showed strong agenda-setting (unemployment, inflation) while others did not (poverty, crime, economy, morality).

Studies that measure issue salience at the individual level define the process of agenda-setting as a direct link between actual media exposure and salience. Obtrusiveness in this case can be measured directly for each individual, rather than defining an entire issue as obtrusinve or unobtrusive (Blood, 1981; Einsiedel, Salomone, & Schneider, 1984). Again, the results are mixed, with some studies supporting the obtrusiveness hypothesis, finding that obtrusiveness decreases agenda-setting effects (Blood, 1981; Iyengar & Kinder, 1987, experiment 9), while other studies (Demers, Craff, Choi, & Pessin, 1989; Erbring, Goldenberg, & Miller, 1980; Iyengar & Kinder, 1987, experiment 5) find exactly the opposite -- that obtrusiveness enhances, or at least does not detract from, the exposure-salience link (Einsiedel et al., 1984).

Individual Level Processes Related to Issue Obtrusiveness.

For an individual, an obtrusive issue is one in which there are information sources other than media that influence the level of salience. The apparent relationship between media coverage and issue salience is thus reduced. Information from non-media sources is held in memory and combined with mediated information to produce the overall salience.

Obtrusive issues may obscure the coverage-salience relationship by processes other than the additions to the simple quantity of information held by an individual. Shapiro (1990),

following the logic of Iyengar, Peters, and Kinder (1982), suggests that exposure to the object of an attitude can activate the attitude. Although Shapiro investigates this process in the context of exposure to newspaper headlines, it is no great leap to extend attitude activation to non-media contact with obtrusive issues. Attitude activation from extra-media information sources, including personal experience, will produce changes in individual salience levels which are unrelated to media coverage. Thus, media effects on salience are more apparent for unobtrusive issues.

Issue-Attention Cycle and Past Coverage

Another dynamic aspect of an issue that may help to predict the strength of the agenda-setting effect is the newness of an issue, that is, its place in the issue-attention cycle (Brosius & Kepplinger, 1990; Downs, 1971; Erbring, Goldenberg, & Miller, 1980; Funkhouser, 1973a, 1973b; Iyengar & Kinder, 1987; Neuman, 1990; Watt and van den Berg, 1981). Downs (1971) noted that public perception of crises seems to pass through a cycle of "heightening public interest and then increasing boredom with major issues," (p. 39). Zucker (1978), too, noted that the agenda-setting effect on unobtrusive issues may dissipate after a few years as the public tires of a topic. Weaver et al. (1981) found that the effects of unobtrusive issues decreased over the course of a presidential campaign, although they characterized the decrease as being due to unobtrusive issues becoming more obtrusive through a loss of novelty, which somewhat confuses the issues of obtrusiveness and newness.

There is some recent evidence that the initial stage of the issue-attention cycle has a nonlinear threshold. Neuman (1990) found that the crisis issues of Vietnam (1962-75), racial unrest (1954-80), and Watergate (1972-76) fit a logistic version of the issue-attention cycle, although the gains over a simple linear model of agenda-setting effects were small.

Individual Level Processes Affected by Past Coverage.

There are two major cognitive processes implied in the issue attention cycle. The first is the drop off in public attention that Funkhouser (1973b) characterized as "adaptation." Using psychological terms, this can be viewed as habituation to a repeated stimulus, and it is classically linked to a decrease in attention and "liking" for the stimulus (Berlyne, 1971, pp. 193-196). In terms of information or the processed residuals of the information retained in memory, we expect that issues will attain the "habituated" status only after much information about the issue has been retained by the audience member. Issues that have received much coverage should show fewer agenda-setting effects than novel issues, as attention to coverage of habituated issues should be less than attention to novel issues.

The second process involves the attitudinal implications of having been exposed to a large amount of information about a topic, as would be the case for habituated issues. Persuasion research (cf. Danes, Woelfel and Hunter, 1978) has shown that it is much more difficult to produce attitude change on issues about which the audience has received much information than it is to produce similar levels of change about new issues. This is conventional wisdom in public relations and advertising---it is much easier to create an attitude or opinion than it is to change an existing one. Saltiel and Woelfel (1975) have conceptualized this as an "information inertia" such that issues about which audience members have low amounts of accumulated information are subject to easy and sometimes dramatic modification by new communications, while high information issues are less responsive to new communications. To use the physical analogy of inertia, a marble (a low information issue) will show much more response when struck with a stick (a communication) than will a boulder (a high information issue).

If we make the reasonable assumption that issue salience, as a form of summative evaluation about a single aspect (the importance) of an issue, involves processes similar to general attitude formation, then the agenda-setting effect should be harder to produce in

issues that have had a long coverage history. Some supporting evidence at the aggregate level of analysis is available. Watt and van den Berg (1981), reasoning that agenda-setting declines progressively over the life of an issue as the news audience accumulates information about the topic, found that agenda-setting effects for a new community problem waned after six months. In a study of environmental topics, Salwen (1988) found that agenda-setting occurred only after 5 to 7 weeks of coverage of a new issue, peaked in 8 to 12 weeks, and dropped off after 12 to 25 weeks.

Coverage Prominence

The basic agenda-setting effect involves the impact of exposure to information about an issue in the media on the salience of that issue within the audience. But actual exposure to media is frequently unmeasured or unmeasurable. Many agenda setting studies measure exposure by simply counting newspaper stories or television minutes (e.g. Neuman, 1990). Others include more complex indicators of coverage prominence such as headline size, use of videotape, etc. (e.g. Watt and van den Berg, 1981). Both simple story counts and amounts of coverage weighted by prominence approximate the probability of exposure to a story. Coverage prominence measures are superior to story counts because they acknowledge structural and presentational elements of the news story (Behr & Iyengar, 1985; Eaton, 1989, McCombs & Shaw, 1972; Salwen, 1988). Stories in the media indicate their importance (and thus the agenda of the media) to the audience by virtue of their placement, length, or other treatment.

While some studies choose to limit the types of content to coverage predefined as prominent (e.g. Demers, et al., 1989; Winter & Eyal, 1981), others prefer to weight each story by its prominence characteristics (Behr & Iyengar, 1985; Eaton, 1989, McCombs & Shaw, 1972; Salwen, 1988; Stone & McCombs, 1981; and Watt and van den Berg, 1981). Empirically, the question of whether weighting coverage enhances detection of television

agenda-setting effect has found mixed answers -- in Behr & Iyengar (1985), only lead TV stories showed effects, but Brosius & Kepplinger (1990) found that TV news agenda-setting effects were not stronger for lead stories. McCombs & Shaw (1972) found similar agenda-setting effects for major and minor stories on NBC news, but slightly higher effects on CBS news for minor stories (p. 185).

Individual Level Processes Affected by Prominence.

Highly prominent stories should have an indirect effect on issue salience by increasing the probability that individual audience members are exposed to the story. Prominent stories, which are allotted more print space or time in broadcasting, should also transmit a larger amount of information to the audience. Pictures and videos in prominent treatments supply additional information, and may aid in audience remembering the story by providing memory "hooks".

Since prominence may make a difference in exposure to the coverage, in the amount of information communicated, and may contain direct cues about the salience of the issue in the eyes of the media, the more conservative course is to include story prominence characteristics in measures of media coverage.

A Model of Accumulated Declining Coverage Effects

Our review of the agenda-setting research has indicated the implied presence of several general cognitive processes: memory, attitudinal inertia, habituation, and selective attention. By extending the implications of these individual-level processes, we can construct a set of predictions for the aggregate behavior of audiences.

An important caveat is in order. While the predictions of our model are based on individual-level processes, they will be tested with aggregated data on public opinion. For this reason, the model cannot confirm the presence of these processes; it can only test for

their plausibility. The ultimate test of our model is comparative: can it explain the aggregate behavior better than existing models (which also imply, but do not explicate, individual-level processes)?

By basing the model on known processes occuring in individual audience members, the predictions of the agenda-setting effect become quite detailed. More importantly, a plausible explanation for their operation is provided. The presumed cognitive processes may also help to explain some of the discrepancies in previous findings noted in the literature summary.

While a fully developed model would include all these cognitive processes, we will focus on two: the dynamic implications of memory processes and their effect on optimal effect time spans, and the moderating effects of accumulated coverage of issues.

It is appropriate to begin with an articulation of our assumptions:

Assumption 1 : The effect of any communication is maximum at the point of exposure to the communication, and the decay of the effect is continuous over time. The decay of the effect is analogous to forgetting, and will be referred to by this convenient term for the remainder of this discussion. Although there is some evidence that memory for raw factual information is only modestly related to media effects (cf. McGraw, Lodge & Stroh, 1990), we are defining memory as a more encompassing construct. It includes retention of evaluative weights and other higher-order cognitive artifacts.

Assumption 2: The form of the decay is a decreasing exponential, similar to simple memory decay.

Assumption 3: The effects of exposure to communications are cumulative over time.

Assumption 4: Salience, at the individual level, is a type of opinion, which can be formed and modified by exposure to communication (the basic individual-level

agenda-setting assumption). Specifically, increases in exposure to communications produce greater saliences.

Assumption 5: Individual saliences can be aggregated into public opinion. In particular, the percentage of the public which identifies an issue as important is a function of salience of the issue within the individuals who make up the public.

The first two assumptions imply that receivers of a communication do not have perfect memory of all coverage to which they have been previously exposed, nor do they retain the effects of communications perfectly for some arbitrary period, then forget entirely. Research on memory since Ebbinghaus (1885, in Woodworth and Schlosberg, 1960) has generally indicated that memory decays exponentially, with most information forgotten soon after exposure, and with decreasing amounts forgotten as time progresses. Memory traces never disappear completely, but can approach a near-zero state after some time period. An exponential decay process can be described with the following equation:

$$\mathbf{P}_t = \mathbf{M}_0\mathbf{e}^{-kt} \qquad (1)$$

where P_t is the dependent variable at time t (amount of information remembered, or more generally, retained effect of exposure to the communication), M_0 is the original amount of mediated information, e stands for the natural logarithm base, and k is the decay time constant.

When a story first appears in the media, at $t = 0$, then $P_0 = M_0e^0$, which reduces to $P_0 = M_0$. As time progresses, the exponent becomes increasingly negative, and P_t declines and approaches zero (total forgetting or absence of communication effect).

Importantly, the equation permits us to measure the rate of effect decay by estimating k. If k is large, the decline is rapid. If k is small, the decline is slow. If k is zero, then the exponent is always zero, so there is no decline over time, and the model becomes one which

assumes perfect memory--all effects are accumulated over time, and the influence of any particular story never decays.

By adding the exponentially declining effects of all prior media stories at a time point, the idea of a decay in effect of individual stories is joined with the idea of impact accumulation over a number of stories. This makes the effect of media coverage cumulative, as dictated by Assumption 3.

Applying Assumption 4, we see that at a given point in time the salience of an issue is affected by current media coverage, as well as by the remaining effects of all prior coverage, with the most recent stories having the strongest effects. This seems to be a more intuitive representation of the dynamic coverage-salience process than alternative models which assume perfect memory or no memory at all. The mathematical representation of the accumulated declining effects model is:

$$Salience_t = f(AccumulatedCoverage_t) = a \sum_{i=0}^{t} M_t e^{-ki} \quad (2)$$

Assumption 5 is a critical one, and requires some justification. How might individual saliences, which are assumed to be smoothly responsive to the accumulated declining effects of media coverage (Assumptions 3 and 4), be translated into aggregate public opinion statements like rankings of the importance of issues in percentages of the entire public? By examining salience levels within individuals, then aggregating across the entire public, we can see that individual saliences can be mapped into aggregate public opinion in a consistent fashion.

Suppose intense media coverage produces very high salience for an issue, such as the outbreak of a small war. Because of individual differences in exposure to media and in response to messages, the individual salience level for this issue is higher than the individual salience of any other issue for only half the members of the audience. When public opinion polling is conducted, the war will then be mentioned by 50% of the public as

the most important issue, while other issues will be mentioned by the other half of the public. Now suppose peace breaks out and media coverage of the war ceases, and the effects of past exposure decay exponentially within individuals. At some point the salience of this issue will fall below the salience of some competing issue (like the economy) for each member of the public. If continuous public opinion polling is taken in the audience, the aggregate data for this issue will show a smooth decline from 50% to zero as more and more individuals fail to mention the issue.

Examples of aggregated accumulated declining effects with different time constants are shown in Figure 1. Three stories are shown, each able to produce an immediate increase in accumulated effect of 10 units. The case of $k = 0$, which represents perfect memory, corresponds to the simple additive model of coverage used in some prior research. Effects are seen to be accumulating in a stair step fashion -- each story causes the amount of retained effect to move up a step. At the other extreme, when $k = 1.0$, the effects of each story decay quickly, and the stories are spaced so that there is little accumulated effect of coverage. When $k = .005$, however, coverage causes a spike in accumulated effect that slowly declines. Since there is new coverage before the effects of the prior stories are dissipated, the overall effect of steady coverage is a general upward trend.

We must note that this formulation is in direct conflict with the idea of a threshold effect for coverage, as presented by Neuman (1990). Media effects can be seen to be strongest immediately after exposure, even if prior coverage of the issue is zero. There is no threshold effect.

MacKuen (1981) modeled the agenda-setting process at the aggregate level in a form that can be viewed as a type of accumulated declining effects model. He used a rather complicated, but very powerful, impulse response procedure to represent a model of declining effects of coverage after the passage of time. His model involved using several simultaneous exponential decay curves in a feedback loop. Comparing his accumulated

declining effects model to a simple additive model, he found that the former provided a much better fit (pp. 66-68). He used Gallup data between 1960 and 1977, and the number of news magazine articles per month on eight topics. His analyses (pp. 112-120) suggest that the media have an impact on the public agenda that lasts about one month for energy news, four months for civil rights news, and six to nine months for Vietnam, inflation (1962-1972 only), environment, and crime news, even when accounting for objective indicators (such as the inflation rate) and major newsworthy events (such as the Santa Barbara oil spill or the passage of the 1964 Civil Rights bill).

There are significant differences, however, between MacKuen's formulation and ours. First, MacKuen's exponentials are the outcome of the modeling procedure chosen, rather than being dictated a priori by theoretical processes that can be observed in isolation in individual audience members. MacKuen did subsequently discuss the resulting curves in terms of presumed audience psychological and sociological processes, but the nature of the audience response curves were initially determined by mathematical concerns. An impulse response model uses a series of exponential terms to describe the response (in this case, issue salience) of a system (the audience) to an input (media coverage). The exponential terms can be used to model any general system, because with a sufficient number of terms, any arbitrary output of any system can be perfectly modeled. For example, impulse response functions involving exponential feedback terms are routinely employed to analyze vibrations in materials, the frequency response of amplifiers, and the stability of aircraft (cf. Wylie, 1960, pp. 336-341). In contrast, our simpler approach uses only a single exponential term, which operationally represents the cognitive process of simple forgetting that we believe is at the heart of the declining effects of coverage.

Furthermore, the response of the MacKuen model is different than the model which we propose. Coverage does not have an immediate impact in MacKuen's model, but must persist for a time while the impact builds. This is similar to the coverage threshold

described by Neuman (1990). As Figure 1 shows, our simple model implies that the impact of coverage is maximum right at the point of exposure to coverage. We feel that this is more consistent with the results of cognitive psychological research which typically shows maximum effects immediately after exposure to a communication.

HYPOTHESES

Based on the reasoning outlined above, we expect to see the following in our declining effects model:

H1: Higher levels of accumulated coverage will be associated with higher issue salience.

This is the basic agenda setting hypothesis, modified to accommodate the memory process.

H2: The association between accumulated coverage and issue salience will be lower for obtrusive issues than for unobtrusive issues.

Obtrusive issues will provide additional, unmediated information inputs to the memory process, which may also serve to prime attitudinal processes. This input to the salience formation process is unrelated to media coverage, so the relationship between coverage and salience will be depressed.

H3: The association between accumulated coverage and issue salience will be lower for issues which have received chronic coverage than for novel issues.

After long periods of coverage, the response to any individual item or burst of coverage should be small, so the issue salience will show little change. This may be because less attention is paid to issues which have had large amounts of coverage in the past (habituation), or because salience attitudes are firmly fixed on the basis of information received from past coverage (attitudinal inertia).

METHOD

We chose three issues to examine -- inflation, Iran, and the Soviet Union. These issues differ on obtrusiveness and the amount of prior coverage during the years under study (1979- 1983). The two foreign affairs topics are unobtrusive by most definitions (excluding definitions which allow chronic media coverage as an agent of obtrusiveness) (Blood, 1981; Winter, 1981), while inflation is obtrusive (Blood, 1981; Winter, 1981; Zucker, 1978). Most audience members had no direct contact with the events in Iran or the Soviet Union, while most were affected directly by inflation.

Iran is the most novel issue during this time, since there was little commanding American attention until the revolution and the American hostage crisis (late 1979 until January 1981). Of the three issues, we expect that the correlation between salience and accumulated coverage should be highest for news about Iran, since it was both a novel and unobtrusive issue.

Inflation, however, had been a problem for 6 years prior to the start of our study period, making it rank in the middle of the three issues in terms of novelty. Thus, some prior accumulated information should moderate the effects of current coverage. Overall, we expect inflation news coverage to produce a smaller relationship with salience than did coverage of Iran.

The third issue, the Soviet Union, has featured prominently in news since World War II, making it a very old issue. We make the assumption that the effects of the extreme age of the issue and its associated huge amount of prior coverage outweigh the effects of low obtrusiveness (a reasonable assumption, given the media time and space devoted over 30 years to the issue), so we predict that news coverage of the Soviet Union will produce the smallest relationship with the issue salience.

To examine the hypotheses, we used the basic information provided by daily television network news coverage of the three issues, and archived public opinion data from 1979 to 1983. Because television provides the news to the most citizens (Robinson & Levy, 1986) and is equally or more credible than print (Hiebert, Ungurait, and Bohn, 1991, p. 526), some (Brosius & Kepplinger, 1990; Behr and Iyengar, 1985; Zucker, 1978) have argued that it is important to test agenda-setting with television, rather than with print as many earlier studies did. We have chosen to follow this suggestion.

The public opinion data was obtained from the archives at the Roper Center for Public Opinion Research, University of Connecticut. Opinions about the salience of an issue was measured using the answer to the standard poll question, "What do you think is the most important issue facing this nation?" It was asked approximately once a month during the study period, by eight different organizations, for a total of 61 polls. Information about each poll, including the date, N, organization, and type of interview (personal or telephone) is given in Appendix A. The date assigned to each poll was the midpoint of the interval over which the poll was taken. Aggregate issue salience was operationalized as the percent of respondents in each poll who rated the issue as most important. The percentages were linearly interpolated between polling dates to attain salience values on a daily basis. This was done because actual media coverage data was available on a daily basis. This procedure introduces some autocorrelation in the dependent measure of issue salience, but no such effect is introduced in the independent measure of media coverage, so the magnitude of the relationship between the two is not inflated.

Network news coverage was coded from daily entries in the Television News Index and Abstracts (TNIA, 1979-1983) from the Vanderbilt Television News Archives. Each story concerning the three study issues was coded for the following prominence features: amount of time devoted to the story, whether film/videotape footage was shown, time placement

within the broadcast, and the identifying sentence describing the story content. A total of 9948 stories were coded, covering 1826 days.

For each story, a prominence score was computed using the following formula, adapted from Watt and van den Berg (1981):

$$Prominence = \frac{(TPT - TNS)}{TPT} + \frac{DS}{150} + FF \qquad (3)$$

TPT is the total news program time (set at a constant 1800 seconds), *TNS* is the time from beginning of newscast to the beginning of the story (in seconds), *DS* is the duration of the story (in seconds, divided by 150 for the typical length of a news story), and *FF* is the presence (coded 0.5) or absence (coded 0.0) of film or video. Stories that are longer, nearer to the beginning of the newscast and which use video footage will have higher prominence scores.

When multiple stories on the same issue were covered in the same day, the prominence scores for those stories were added to give a total for the day. Scores were also added across networks. Thus, we have ratings of prominence for each topic on a daily basis during the study period.

Three persons coded the stories. Two intercoder reliability tests were conducted by having the coders each rate a subset of the stories. The first gave an average correlation for the independently coded prominence scores of r = .96 (p .001, n = 86) among coders, and the second gave an average r = .92 (p .001, n = 75).

At each time point, the amount of accumulated coverage was computed by adding the current prominence score for the time point to the exponentially declining prominence of all previous time points, as in Equation 2. In essence, this represents the total accumulated effects of coverage likely to be retained by an audience member, after accounting for forgetting. Initial values of the accumulated coverage were estimated by reflecting the first

180 days of coverage backward in time, and using this pseudo-coverage as if it represented coverage during the six months prior to the start of the study.

Since the research question involved investigating different rates of forgetting, we tested 12 rates of decay for each issue. These ranged from a rate in which 95% of the coverage impact disappears in 3 days, to a 95% loss that took 3000 days. We also computed a perfect memory case in which there was no forgetting (prominence scores were just added over the span of the study), and a total forgetting case (only current coverage was correlated with public opinion).

Since the interpolation of public opinion levels to obtain daily public opinion estimates introduces autocorrelated error, analyses were conducted for both the interpolated daily estimates (N = 1826) and for only the days on which public opinion data was actually reported (no interpolation, so N = 61 days).

RESULTS

Both the interpolated and uninterpolated correlations between accumulated coverage and issue salience are shown in Table 1. Since they are very similar, with the exception of somewhat lower peak values for the issue of Iran, the interpolated values will be used in this discussion.

The public opinion and coverage prominence trends are shown in Figures 2-4. In Figure 2 (the issue of Inflation), three values are plotted against time for the full duration of the study: the prominence of daily coverage, the salience of the issue, and the amount of declining accumulated coverage produced when the exponentially declining prominence is summed for all prior time points.

Figure 2 shows little apparent relationship between the unaccumulated coverage and salience of the issue of inflation. However, Table 1 shows that a small correlation of .23

between daily coverage and daily levels of salience does exist for the interpolated values. But Table 1 shows a much stronger correlation of .58 between declining accumulated coverage and salience when an exponential time window of 600 days (k = .005) is used. This value for accumulated coverage produced the plot shown in Figure 2. The relationship between it and the salience plot is much more evident.

Figure 3 shows a portion of a similar plot for the Iranian issue. Here the relationships among prominence, accumulated coverage , and salience are clear and strong. According to Table 1, the optimum period for accumulating coverage is only 30 days (k = .10) for this issue. Because of this relatively short time window, the accumulated coverage curve tracks the coverage prominence much more closely than it did with the Inflation issue, and both are clearly associated with the issue salience curve. The daily correlation (no accumulation of coverage) between coverage prominence and salience is a strong .59, while the optimum accumulation interval of 30 days gives a very strong correlation between accumulated coverage and salience of .71.

Figure 4 shows accumulated coverage and issue salience plotted over a portion of the time for the Soviet Union issue. The coverage prominence was omitted from this plot, as the daily values of coverage showed very little relationship to salience. The .11 correlation value in Table 1 confirms this. The 60-day accumulation time window (k = .05) gives a curve with a somewhat stronger .34 correlation, as shown in Figure 4.

We predicted that issue age (amount of coverage prior to the 5-year span examined in this study) and obtrusiveness would decrease the amount of the agenda-setting effect, as measured by the correlation between coverage prominence and salience. We expected that news about Iran would show the strongest correlations, inflation the next highest, and the Soviet Union the lowest correlations. These predictions were supported, as shown in Table 1. Although each of the issues had different accumulation time windows, the size of the correlations followed the predictions closely.

To answer the research question as to which memory decay rate was optimal, we can refer to Table 1. The correlations in this table are plotted in Figure 5. For inflation news, the correlation grew with the accumulation interval (or slower memory decay rate). Between 600 days and 3000 days, however, the agenda-setting effect began to decline again.

For Iranian news, the correlation was strongest between 12 and 60 days, and was optimal at 30 days. Thereafter, the correlation between accumulated coverage prominence and salience declined rapidly. At perfect memory (infinite forgetting time span), content prominence and salience were negatively related for both inflation and Iran news.

Soviet Union news showed very long accumulation time spans. The decline over longer accumulation time spans was relatively slow. Unlike the other two issues, the agenda-setting correlation did not reverse under the assumption of perfect memory, but the relationship showed a declining trend at the very long time windows.

DISCUSSION

We found an agenda-setting effect for all three issues examined, but there were very different forms of the effect. The strongest agenda-setting effect was for news that was both unobtrusive and early in the news cycle (news about Iran), followed by news that was later in its news cycle and obtrusive (inflation news). The least agenda-setting occurred for news that was very late in its cycle, despite its unobtrusiveness (Soviet news).

Interestingly, we found that the optimal effects span was relatively short for both unobtrusive issues, but was quite long for the obtrusive issue. The optimal accumulation spans for news about Iran (12-60 days) and the Soviet Union (24-120 days) are in the range of other some studies (e.g. Eaton, 1989; Salwen, 1988; Winter & Eyal, 1981). The obtrusive issue of inflation showed longer persistence, peaking at an accumulation window of over 18 months.

We can speculate about the reason for these findings. It may be that obtrusive issues in the news are more actively learned and thus persist longer. Personal experience with the issue may make it more salient at the time of the broadcast, such that the news is encoded "better" in memory by linking news to multiple personal experiences and observations. The media may aid this process by framing the news to emphasize the potential impact on each member of the audience.

There are several methodological points to make. First, the sizes of the correlation coefficients found in this study are comparable to, and sometimes smaller than, those found in other formulations of agenda setting, such as those of Neuman (1990) and MacKuen (1981). But these studies did not use daily values for media coverage and issue salience, nor did they include the impact of prominence. The effects of aggregating coverage and public opinion to a monthly basis smooths daily fluctuations in the data, and increases the size of correlations.

However, a comparative study of agenda-setting models using daily coverage measurements has recently been reported (Yan and Jiang, 1992). The study applied the predictions of our model, the Neuman model, and the MacKuen model on six different issues. Results showed that our model gave better predictions of issue salience for five of the six issues when compared to the Neuman model, and for four of the six when compared to the MacKuen model. The same performance was observed when the coverage was aggregated into weekly blocks.

Since only three issues were used in the current study to test the effects of obtrusiveness and prior coverage, we can offer only modest evidence for the effect of these factors. The Yan and Jiang study reinforces the conclusions about the effects of issue obtrusiveness and prior coverage, as they observed identical patterns of relationship strength in six issues, with obtrusive and old issues showing weaker agenda-setting effects. By sign test, finding six sets

of coefficients in the predicted direction with no contradictory findings surpasses conventional confidence levels ($p = .03$).

A second methodological point concerns very long coverage accumulation time windows. We found no evidence supporting the assumption of a perfect memory for news coverage (the simple accumulated coverage assumption). Perfect memory ($k = 0.0$) gave negative relationships between coverage and salience for two of the three issues, following a series of decreasingly large positive correlations at shorter time window values. There was a small positive relationship for the other issue, but it followed much larger positive correlations. In fact, the reversal of the sign of the relationship for two issues suggests extreme caution in interpretation of apparent reverse agenda-setting effects which have been found in some studies. They may be due to artificially assuming perfect (or very long) coverage accumulation time windows.

Although our formulation of the decaying rates of coverage effects worked as predicted, the idea must be further tested in other types of agenda-setting studies, including individual-level analyses (McCombs, 1981a and 1981b). Additional replications with other issues are necessary to further confirm the impact of issue age and obtrusiveness. These should include media other than television, to insure that media-specific effects are not confused with coverage effects.

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TABLE 1

Correlation Between Accumulated Coverage and Issue Salience

Time Window (Days to 5%)		N	Inflation	Iran	Soviet Union
0 (k = inf.)[1]		1826	.2326***	.5875***	.1147***
		61	.0132	.5631***	.2496
3 (k = 1.00)		1826	.2798***	.6296***	.1421***
		61	.0725	.5784***	.2051
4 (k = .750)		1826	.2943***	.6414***	.1535***
		61	.0990	.5822***	.1983
6 (k = .500)		1826	.3145***	.6579***	.1735***
		61	.1419	.5818***	.1993
12 (k = .250)		1826	.3465***	.6855***	.2224***
		61	.2124	.5676***	.2395
24 (k = .125)		1826	.3807***	.7071***	.2875***
		61	.2714*	.5648***	.3225*
30 (k = .100)		1826	.3947***	.7097***	.3070***
		61	.2907*	.5675***	.3473**
60 (k = .050)		1826	.4538***	.6914***	.3385***
		61	.3668**	.5705***	.3815**
120 (k = .025)		1826	.5159***	.6296***	.3227***
		61	.4500***	.5433***	.3581**
300 (k = .010)		1826	.5486***	.5092***	.2786***
		61	.5025***	.4592***	.3246*
600 (k = .005)		1826	.5815***	.4057***	.2584***
		61	.5502***	.3726***	.3137*
3000 (k = .001)		1826	.2914***	-.0448	.2535***
		61	.3569**	-.0515	.2055
Infinite (k = 0.00)[2]		1826	-.6446***	-.3309***	.2545***
		61	-.5828***	-.3373**	.1777

*** indicates correlation significant at p < .001
** indicates correlation significant at p < .01
* indicates correlation significant at p < .05

[1]This is the correlation between prominence of coverage and issue salience. No effects are accumulated. This represents no memory process (perfect forgetting).

[2]This represents perfect memory. All effects are accumulated.

Figure 1

EFFECTS DECAY TIME CONSTANTS EXAMPLE

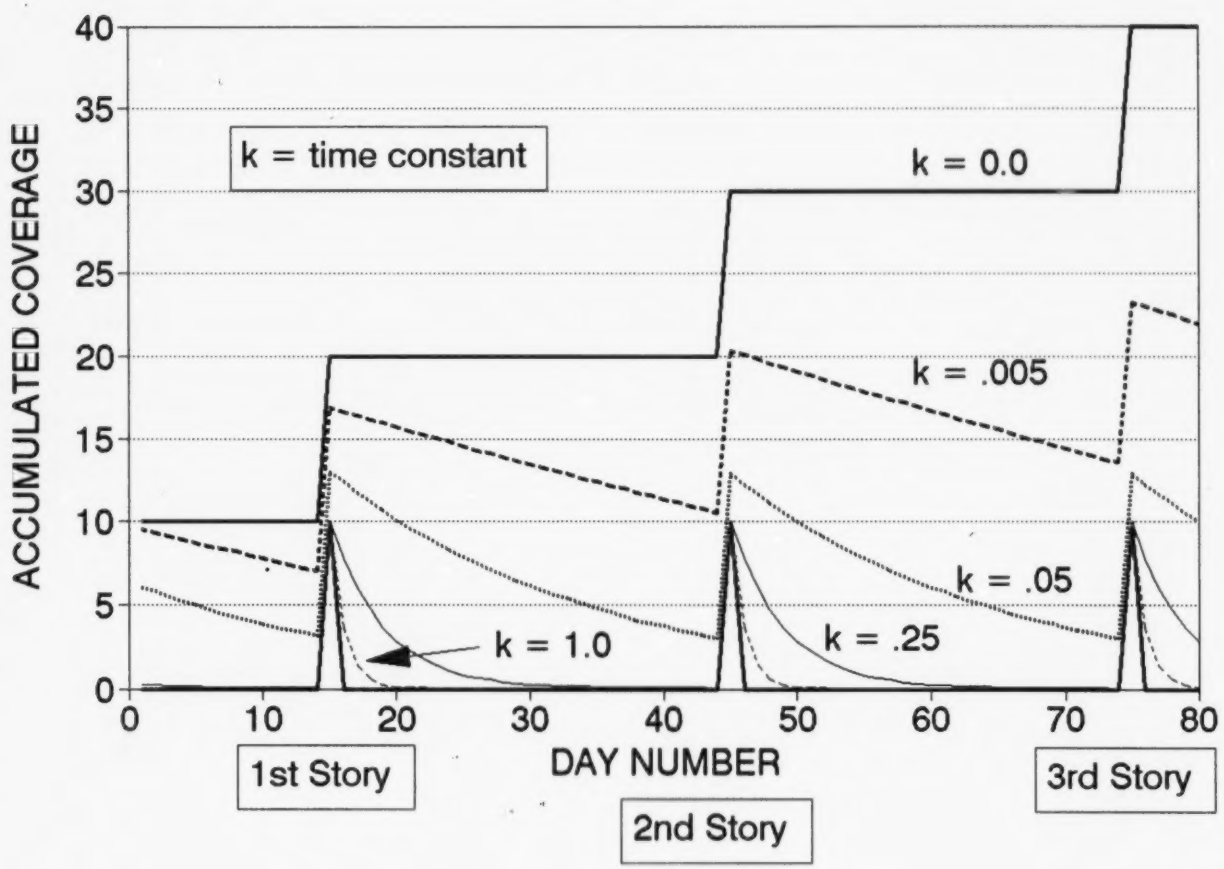


Figure 2
INFLATION

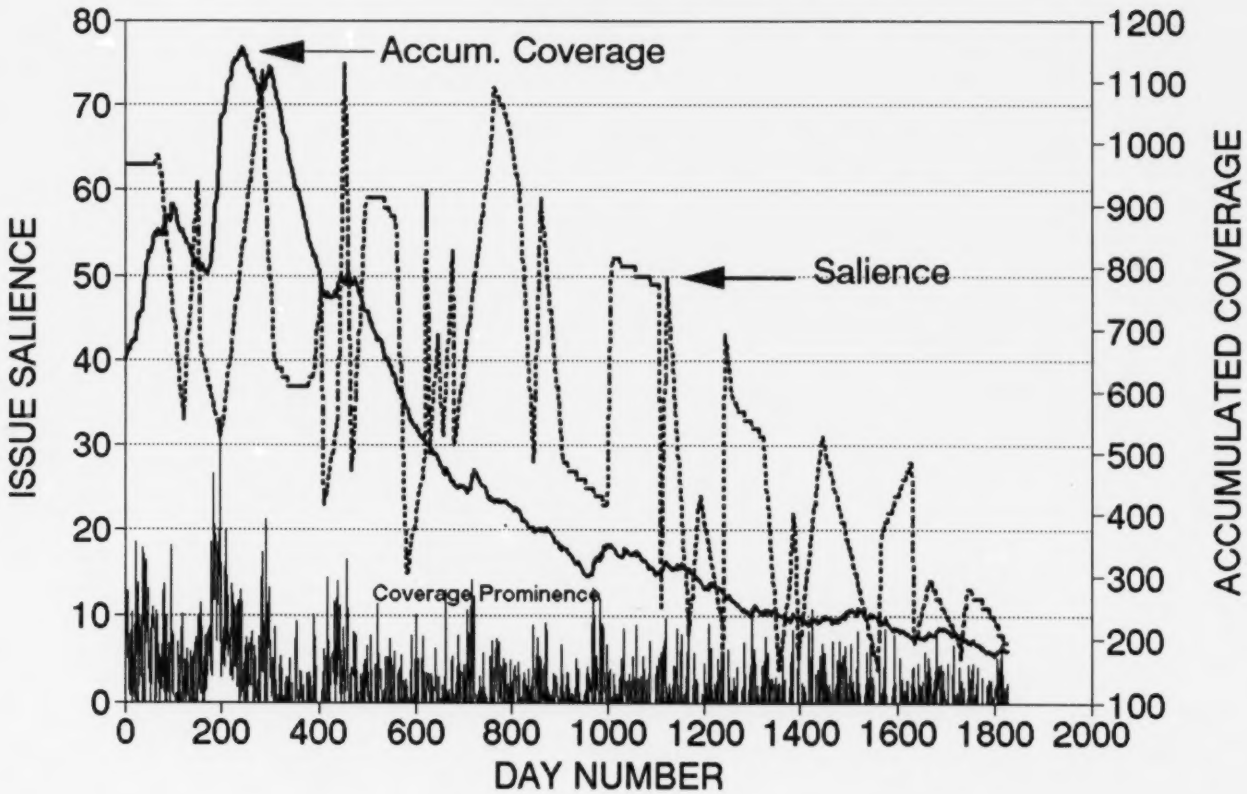


Figure 3

IRAN - EXPANDED VIEW

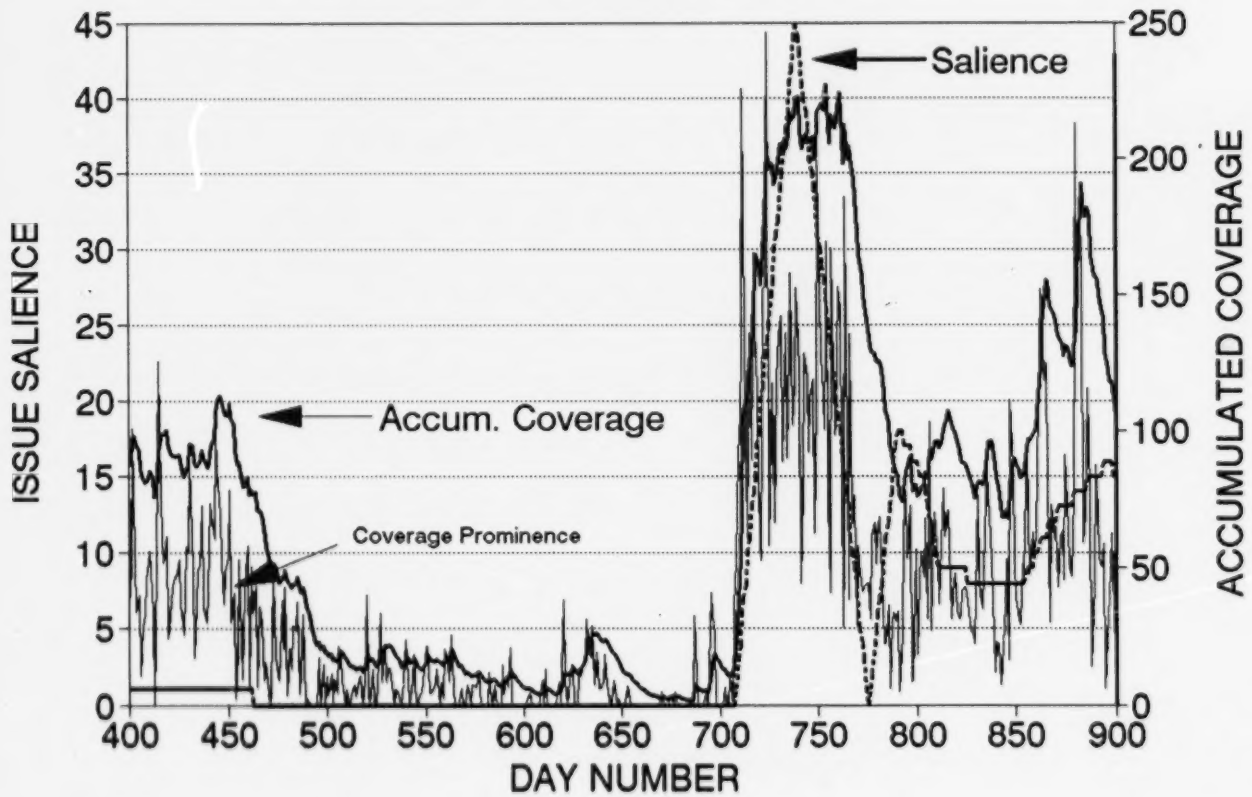


Figure 4

SOVIET UNION - EXPANDED VIEW

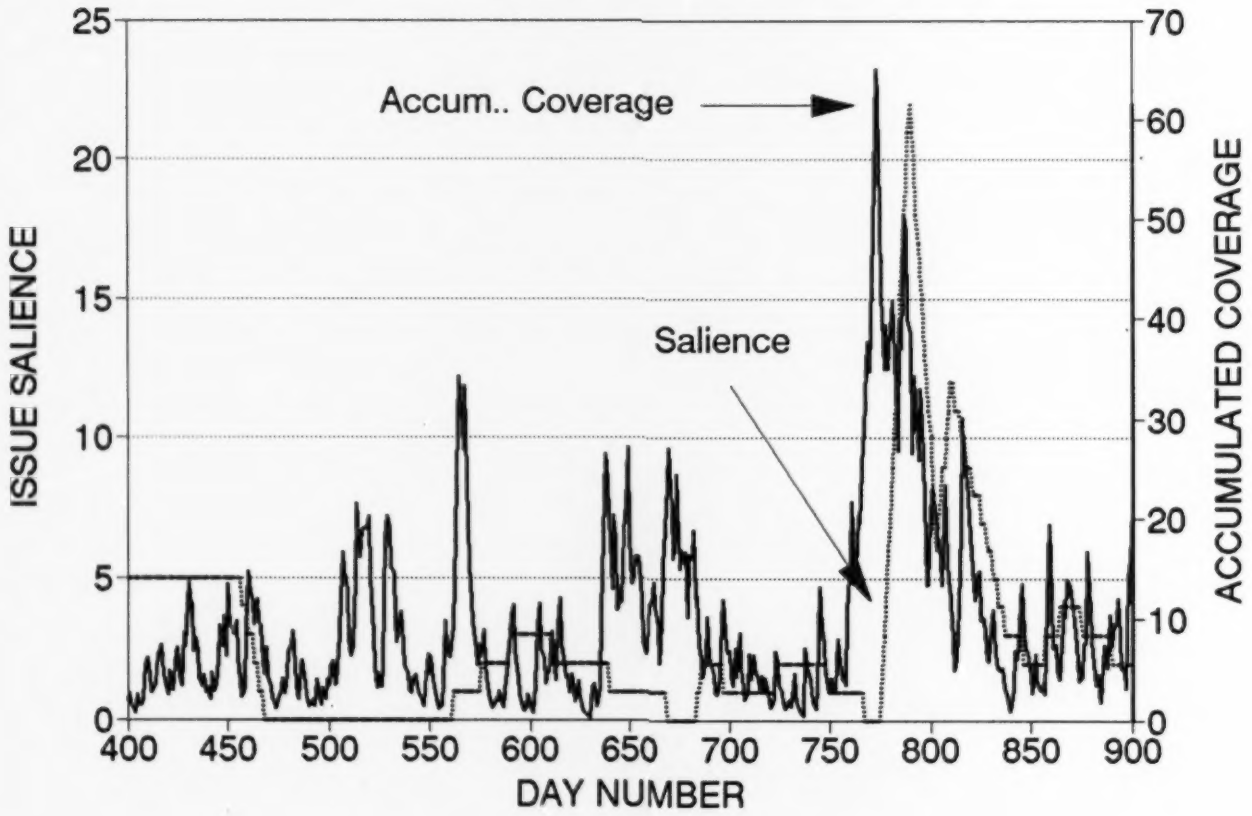
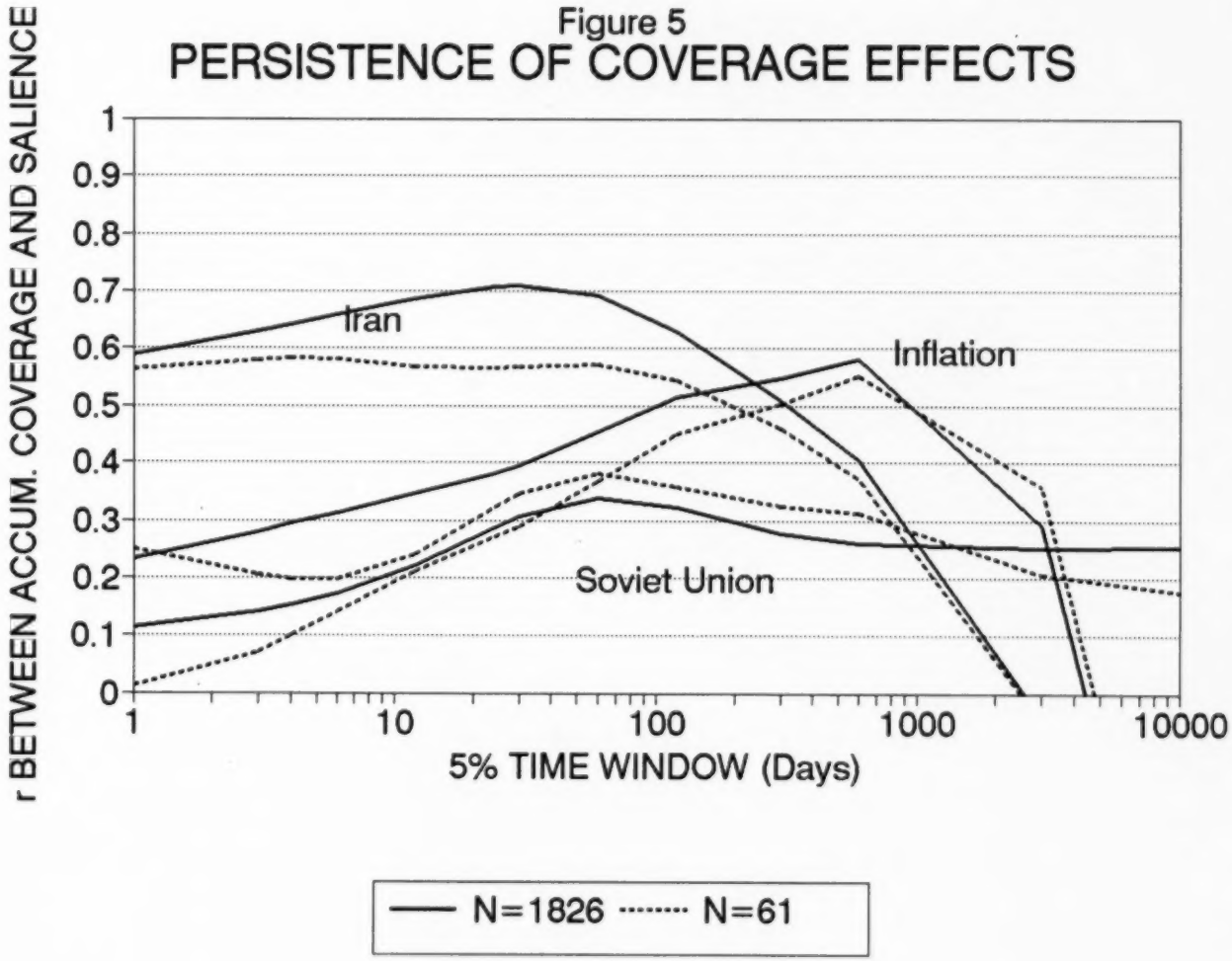


Figure 5

PERSISTENCE OF COVERAGE EFFECTS



APPENDIX A

POLL DATES AND TYPES

Question ID	Date	Organization	N	Interview Type
USGALLUP.1123.Q01B	02-25-79	Gallup	1534	Personal
USCIVIC.79CAMF.R07	03-11-79	Civic Service	1659	Personal
USNBCAP.41.R34	04-30-79	NBC/AP	1600	Telephone
USNBCAP.42.R03	05-29-79	NBC/AP	800	Telephone
USCBSNYT.060979.R12	06-05-79	CBS/NY Times	1422	Telephone
USNBCAP.43.R13	07-16-79	NBC/AP	1599	Telephone
USCBSNYT.101879.R02	10-11-79	CBS/NY Times	1514	Telephone
USGALLUP.1141.Q002A	10-14-79	Gallup	1539	Personal
USABC.111179.R02	11-04-79	ABC	1506	Telephone
USMOR.79HUNG.R01	12-06-79	Market Opinion	1200	Telephone
USCBSNYT.011580.R14	01-11-80	CBS/NY Times	1468	Telephone
USGALLUP.1147.Q002A	01-26-80	Gallup	1597	Personal
USCIVIC.80FIN.R01	02-08-80	Civic Service	1611	Personal
USCBSNYT.021980.R12	02-15-80	CBS/NY Times	1536	Telephone
USCBSNYT.031780.R15	03-14-80	CBS/NY Times	1468	Telephone
USGALLUP.1151.Q02A	03-29-80	Gallup	1571	Personal
USCBSNYT.041780.R11	04-12-80	CBS/NY Times	1605	Telephone
USYANK.80MAP.R01	05-12-80	Yankelovich	1549	Personal
USGALLUP.1157.Q01B	06-14-80	Gallup	1583	Personal
USGALLUP.1159.Q001A	07-13-80	Gallup	1548	Personal
USCBSNYT.080980.R20A	08-04-80	CBS/NY Times	1769	Telephone
USCBSNYT.091680.R14A	09-12-80	CBS/NY Times	1417	Telephone
USGALLUP.1162.Q05A	09-14-80	Gallup	1602	Personal

Question ID	Date	Organization	N	Interview Type
USCBSNYT.092780.R10	09-20-80	CBS/NY Times	817	Telephone
USCBSNYT.292780.R10	09-24-80	CBS/NY Times	810	Telephone
USLAT.36.R032	10-07-80	LA Times	2853	Telephone
USCBSNYT.102280.R10A	10-18-80	CBS/NY Times	2135	Telephone
USGALLUP.185-1.R1	11-08-80	Gallup	1556	Personal
USCBSNYT.111580.R22	11-10-80	CBS/NY Times	2651	Telephone
USCBSNYT.020281.R28	01-27-81	CBS/NY Times	1512	Telephone
USGALLUP.1168.Q03A	02-01-81	Gallup	1609	Personal
USABCWP.30.R01AA	03-02-81	ABC/Wash. Post	1872	Telephone
USABCWP.31.R01	03-27-81	ABC/Wash. Post	1206	Telephone
USCBSNYT.042981.R14A	04-24-81	CBS/NY Times	1439	Telephone
USCBSNYT.063081.R16	06-25-81	CBS/NY Times	1433	Telephone
USCBSNYT.092881.R08A	09-24-81	CBS/NY Times	1479	Telephone
USGALLUP.1183.Q002A	10-04-81	Gallup	1508	Personal
USGALLUP.198-1.R1	01-09-82	Gallup	1484	Personal
USCBSNYT.011882.R13A	01-13-82	CBS/NY Times	1540	Telephone
USABCWP.48.R01	01-26-82	ABC/Wash. Post	1508	Telephone
USCBSNYT.031882.R5	03-13-82	CBS/NY Times	1545	Telephone
USGALLUP.199-1R7	04-04-82	Gallup	1543	Personal
USCBSNYT.052782.R4A	05-21-82	CBS/NY Times	1470	Telephone
USCBSNYT.052982.R5	05-23-82	CBS/NY Times	1470	Telephone
USABCWP.54.R01	05-26-82	ABC/Wash. Post	1018	Telephone
USGALLUP.062782.R1	06-13-82	Gallup	1456	Personal
USGALLUP.204-2.R01	08-14-82	Gallup	1543	Personal
USCBSNYT.092182.R11A	09-16-82	CBS/NY Times	1664	Telephone
USABCWP.62.R12	10-08-82	ABC/Wash. Post	1602	Telephone

Question ID	Date	Organization	N	Interview Type
USGALLUP.206-2.R1	10-17-82	Gallup	1543	Personal
USCBSNYT.103082.R14A	10-26-82	CBS/NY Times	1437	Telephone
USABC.66.R01	12-13-82	ABC	2464	Telephone
USCBSNYT.040083.R04	04-09-83	CBS/NY Times	1489	Telephone
USGALLUP.213-1.R1	04-17-83	Gallup	1509	Personal
USABCWP.76.R01	06-17-83	ABC/Wash. Post	1501	Telephone
USCBSNYT.060083.R6	06-23-83	CBS/NY Times	1365	Telephone
USGALLUP.082583.R1	07-24-83	Gallup	1567	Personal
USABCWP.84.R1	09-24-83	ABC/Wash. Post	1506	Telephone
USCBSNYT.092983.R12	09-26-83	CBS/NY Times	1587	Telephone
USGALLUP.1225.R02A	10-09-83	Gallup	1503	Personal
USGALLUP.219-1.R02A	11-20-83	Gallup	1504	Personal